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Diorio et al.

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(54) **DATA NORMALIZER**

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(52) **U.S. Cl.**
CPC ***G06F 17/30303*** (2013.01)

(58) **Field of Classification Search**
CPC G06F 17/30303
USPC 707/800–805
See application file for complete search history.

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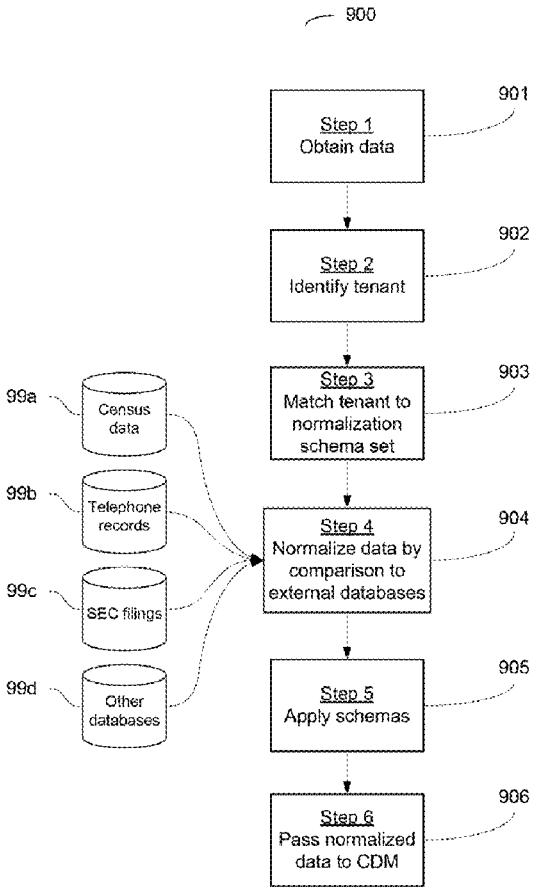
(57) **ABSTRACT**

A data normalizer for processing data for use by a CDM system which is capable of dynamically updating user-defined normalization criteria and which is further capable of operating in a multi-tenant environment in which each tenant has distinct data normalization policies.

18 Claims, 12 Drawing Sheets



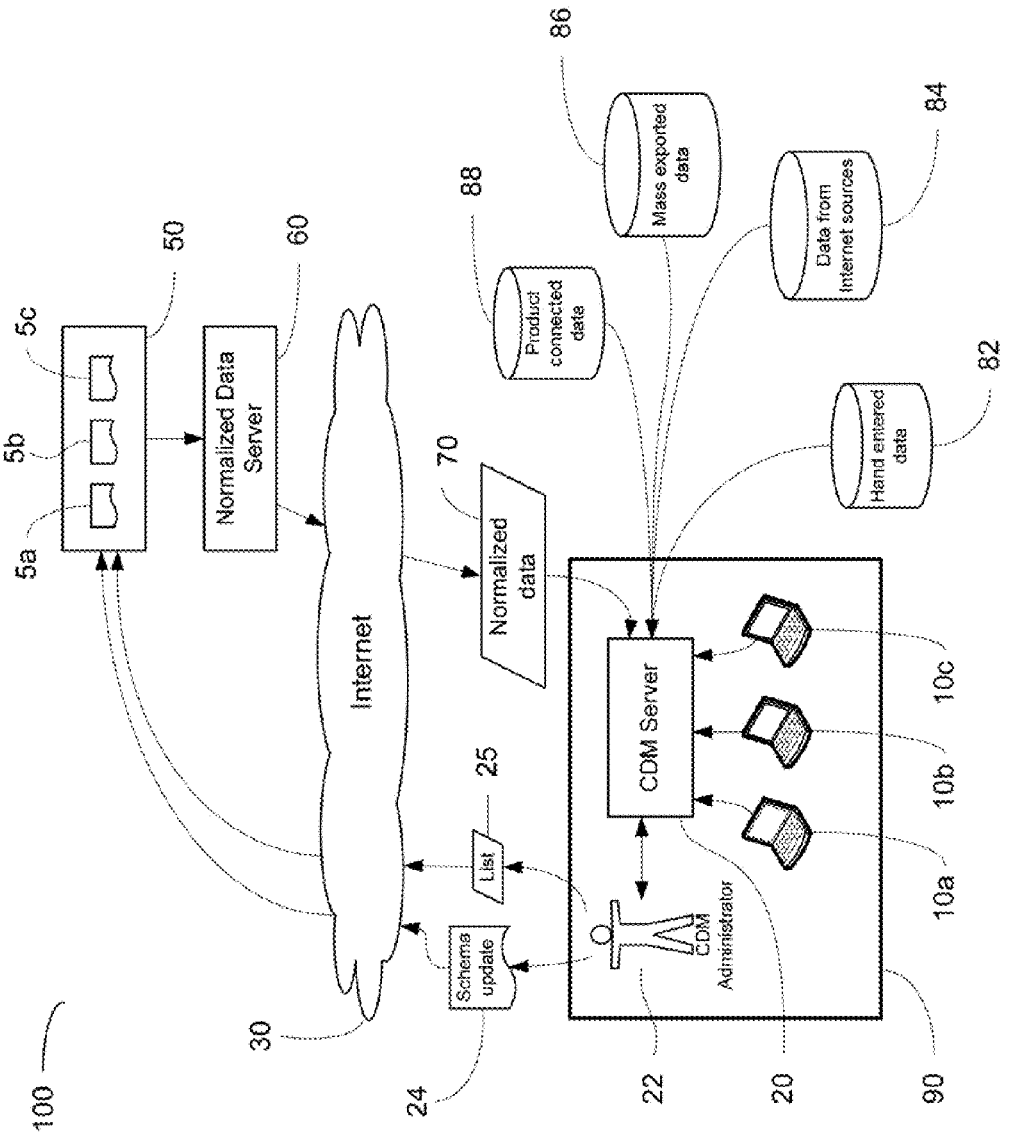

100
5a
5b
5c
50
Normalized Data Server
60
Internet
30
Schema update
24
List
25
Normalized data
70
Product connected data
88
Mass exported data
86
Data from Internet sources
84
Hand entered data
82
CDM Server
CDM Administrator
22
20
90
10a
10b
10c

Figure 1

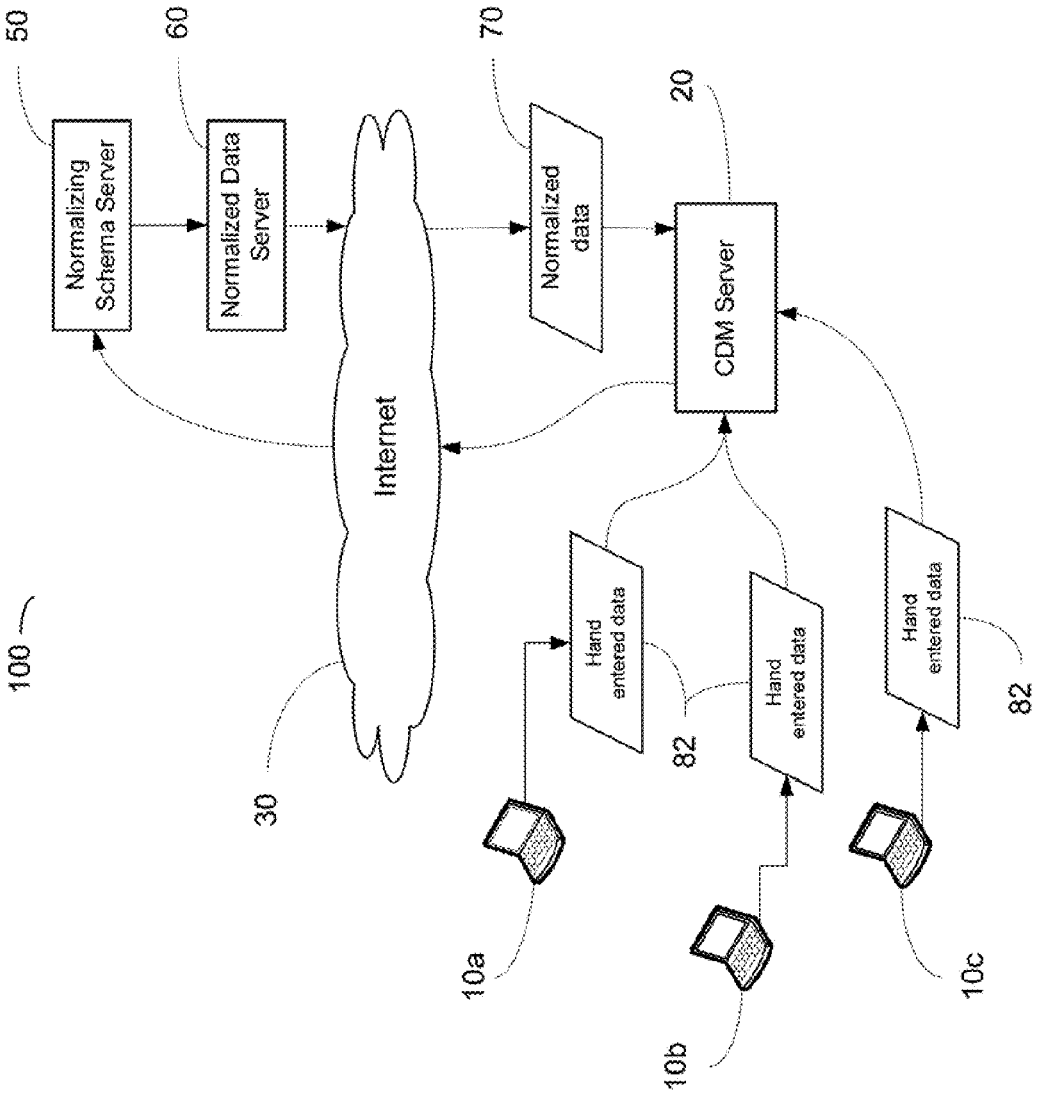

50
60
70
20
Normalizing Schema Server
Normalized Data Server
Internet
Normalized data
CDM Server
100
30
Hand entered data
82
Hand entered data
Hand entered data
82
10a
10b
10c

Figure 2

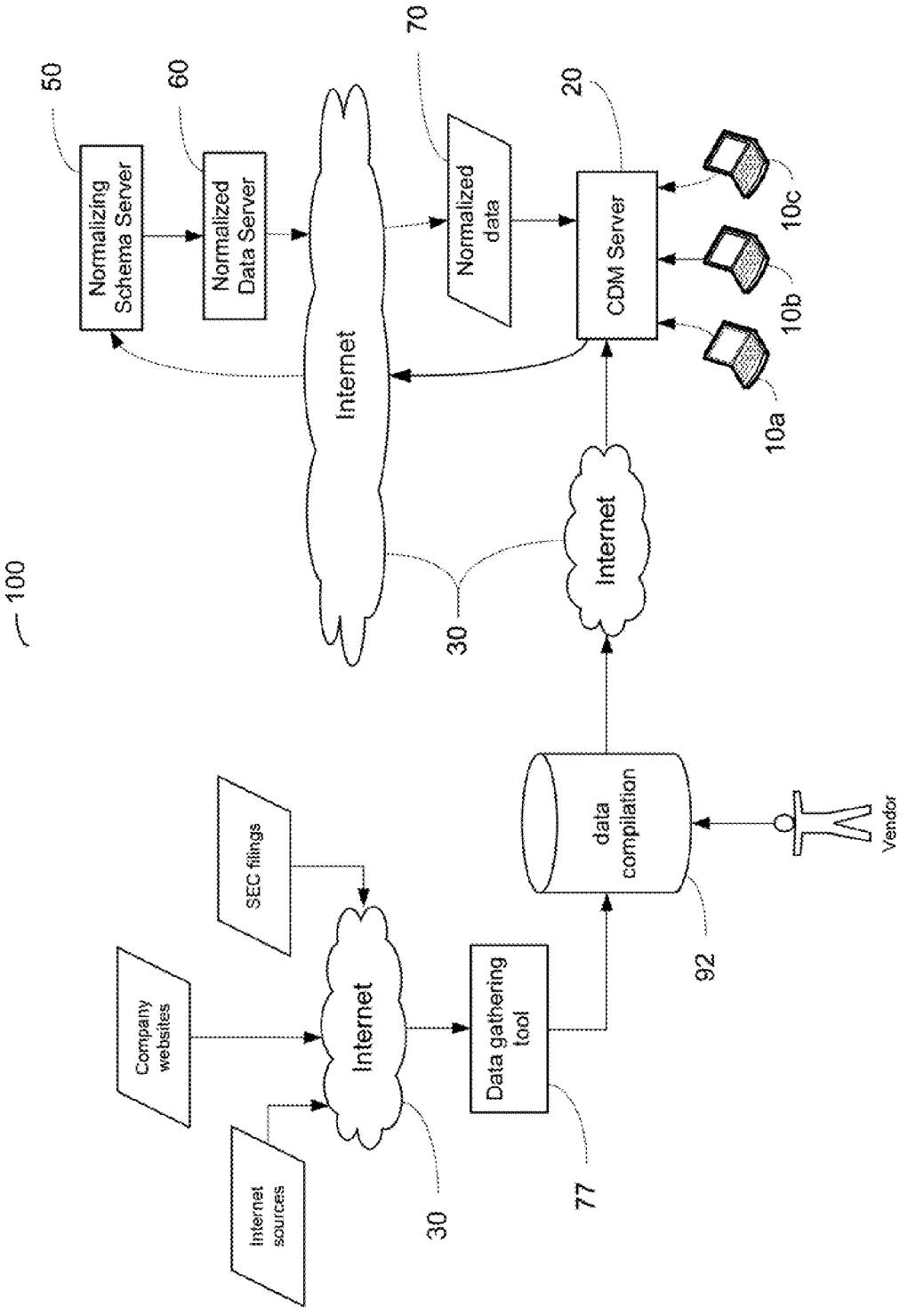

100
50
Normalizing Schema Server
60
Normalized Data Server
Internet
70
Normalized data
20
CDM Server
10a
10b
10c
30
Internet
Company websites
SEC filings
Internet sources
Internet
30
Data gathering tool
77
data compilation
92
Vendor

Figure 3

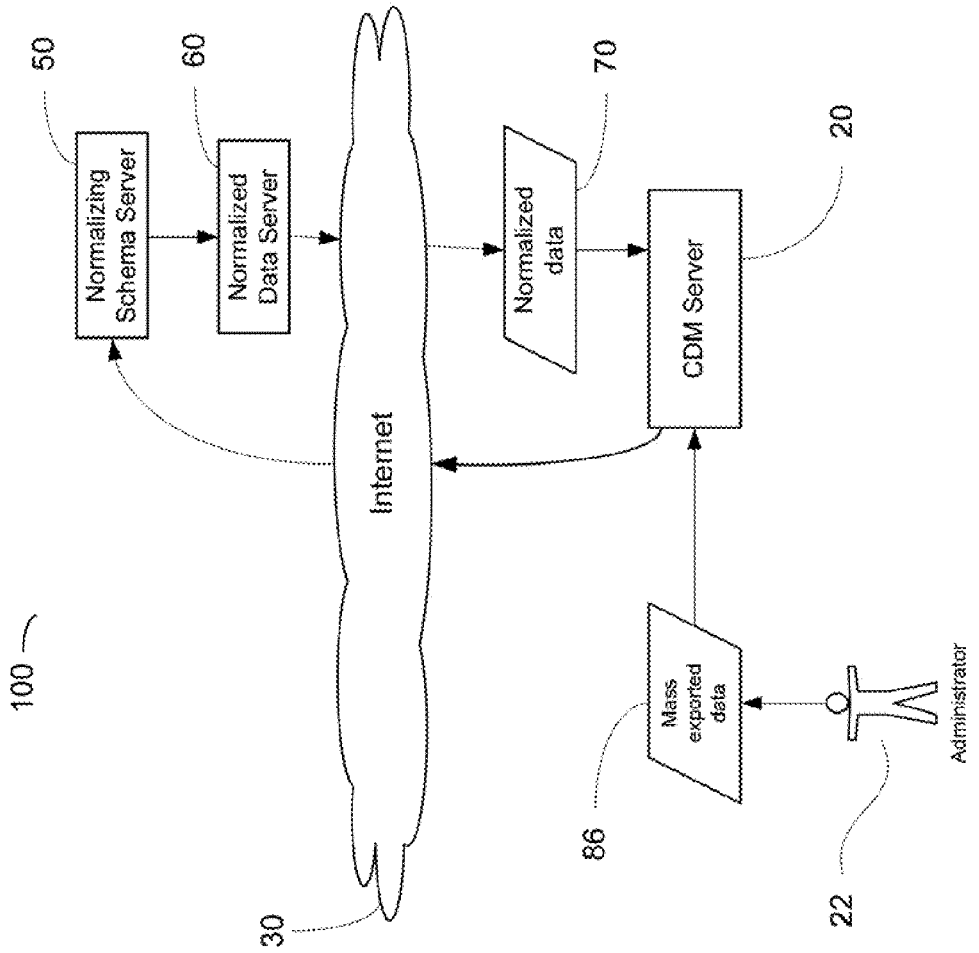

100
50
Normalizing Schema Server
60
Normalized Data Server
30
Internet
70
Normalized data
20
CDM Server
86
Mass exported data
22
Administrator

Figure 4

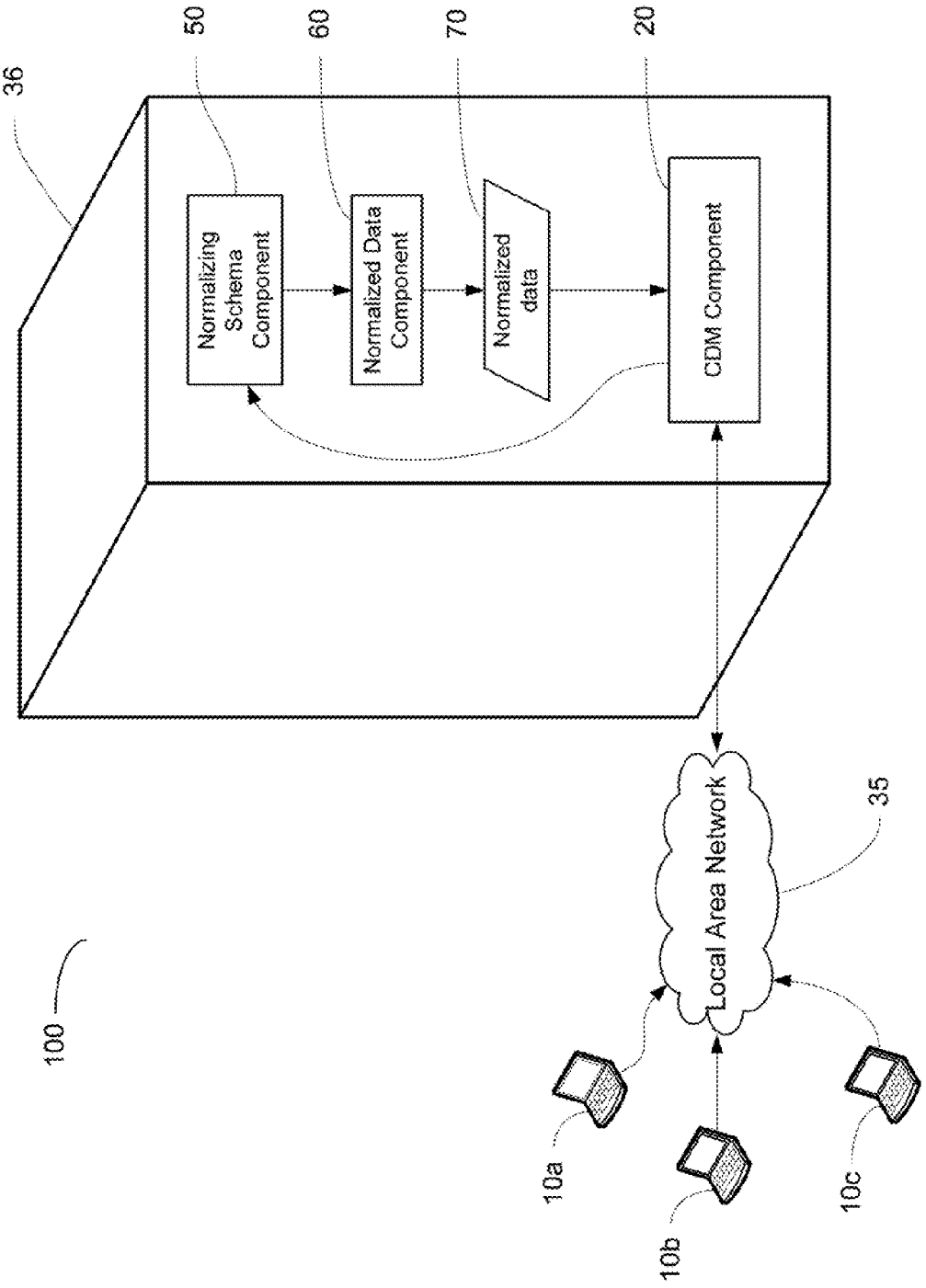

100
36
50
60
70
20
Normalizing Schema Component
Normalized Data Component
Normalized data
CDM Component
Local Area Network
35
10a
10b
10c

Figure 5

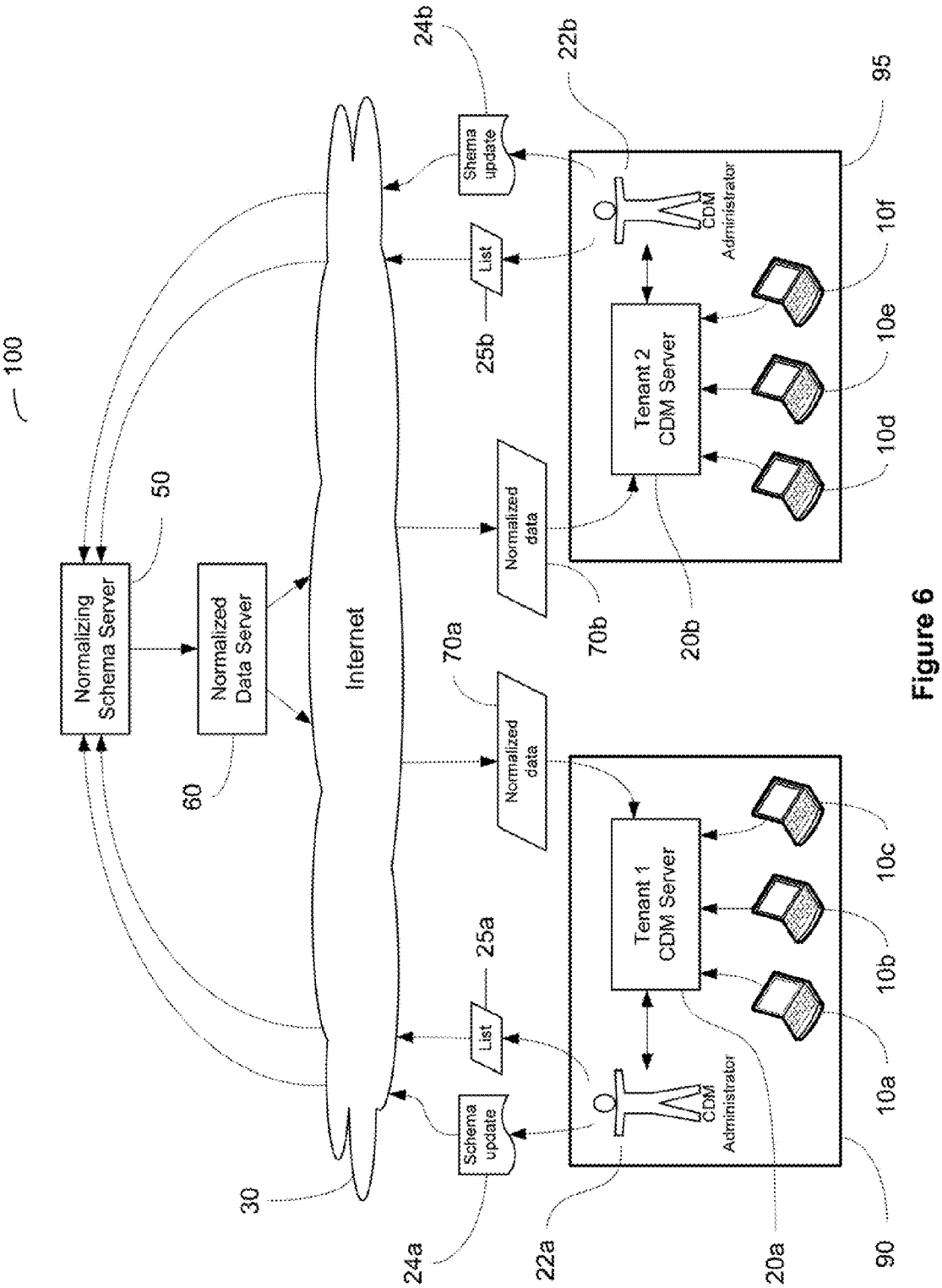

100
Normalizing Schema Server
50
Normalized Data Server
60
Internet
30
Schema update
24a
List
25a
Schema update
24b
List
25b
Normalized data
70a
Normalized data
70b
Tenant 1 CDM Server
Tenant 2 CDM Server
CDM Administrator
CDM Administrator
22a
22b
20a
20b
90
95
10a
10b
10c
10d
10e
10f

Figure 6

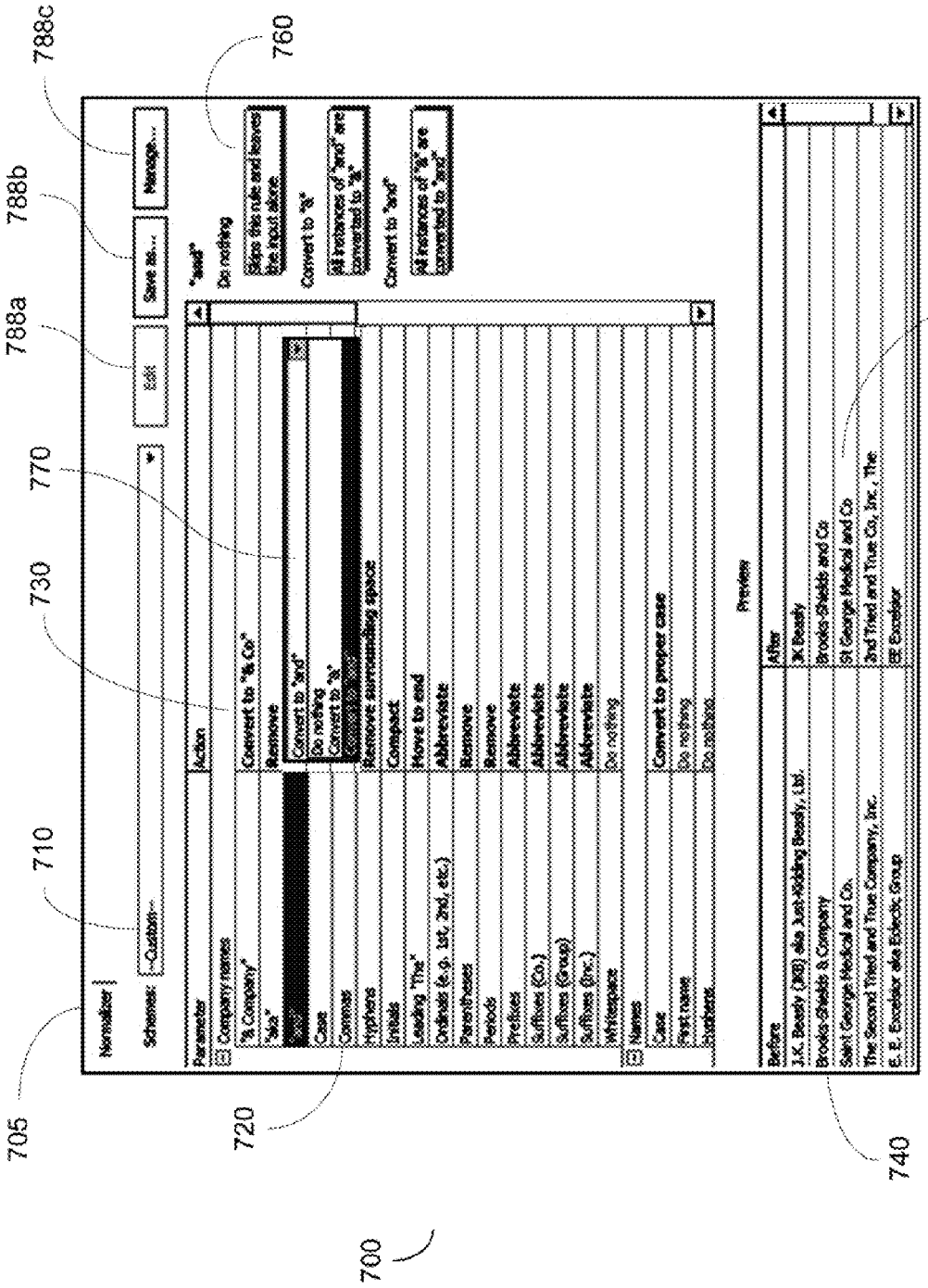

788c
760
788b
788a
770
730
710
705
720
750
740
700
Normalizer
Scheme:
Custom
Edit
Save as...
Manage...
Parameter
Action
Preview
Before
After

Figure 7a

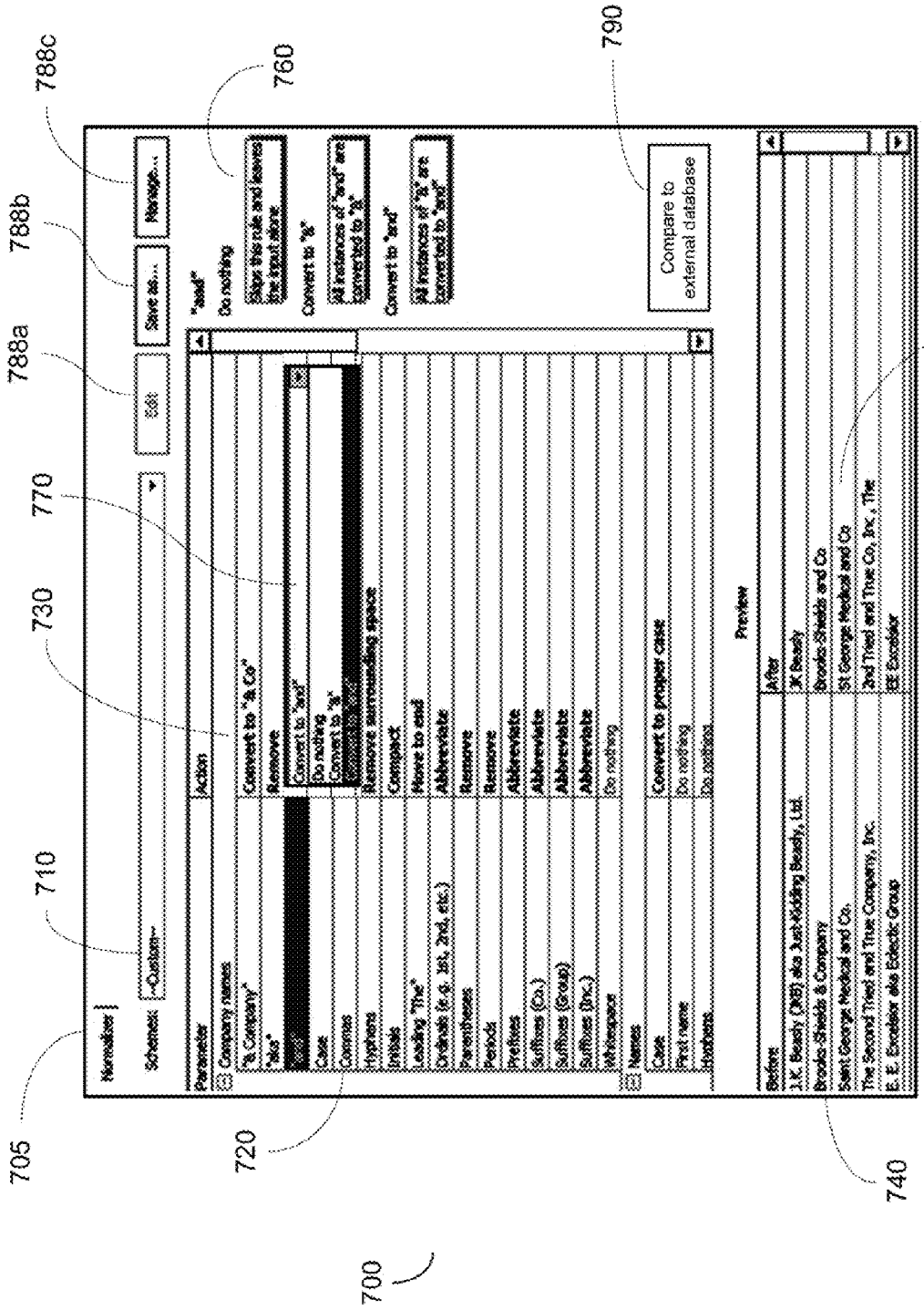

700
705
710
720
730
740
750
760
770
788a
788b
788c
790
Normalizer
Schemas:
<Custom>
Edit
Save as...
Manage...
Parameter
Action
Company names
"& Company"
"&"
Case
Commas
Hyphens
Initials
Leading "The"
Ordinals (e.g. 1st, 2nd, etc.)
Parentheses
Periods
Prefixes
Suffixes (Co.)
Suffixes (Group)
Suffixes (Inc.)
Whitespace
Names
Case
First name
Suffixes
Convert to "& Co"
Remove
Convert to "and"
Do nothing
Convert to "&"
Remove surrounding space
Compact
Move to end
Abbreviate
Remove
Remove
Abbreviate
Abbreviate
Abbreviate
Abbreviate
Do nothing
Convert to proper case
Do nothing
Do nothing
"and"
Do nothing
Skip this rule and leaves the input alone
Convert to "&"
All instances of "and" are converted to "&"
Convert to "and"
All instances of "&" are converted to "and"
Compare to external database
Preview
Before
After
J.K. Beauty (OEI) aka Just-Kidding Beauty, Ltd.
JK Beauty
Brooks-Sheids & Company
Brooks-Sheids & Co
Saint George Medical and Co.
St George Medical and Co
The Second Tried and True Company, Inc.
2nd Tried and True Co, Inc., The
E. E. Excelsior aka Eclectic Group
EE Excelsior

Figure 7b

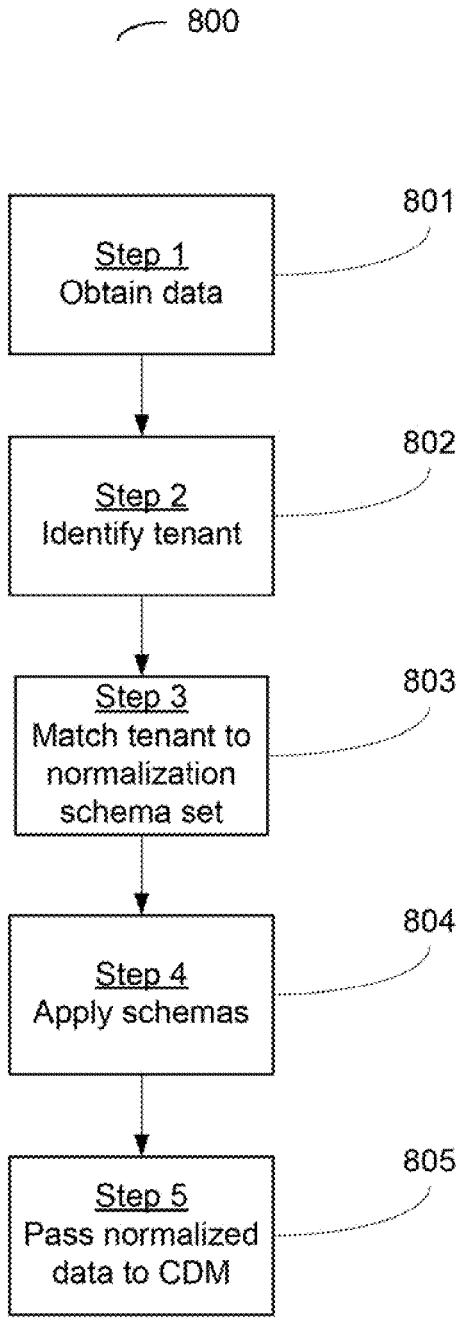

800
801
Step 1
Obtain data
802
Step 2
Identify tenant
803
Step 3
Match tenant to normalization schema set
804
Step 4
Apply schemas
805
Step 5
Pass normalized data to CDM

Figure 8

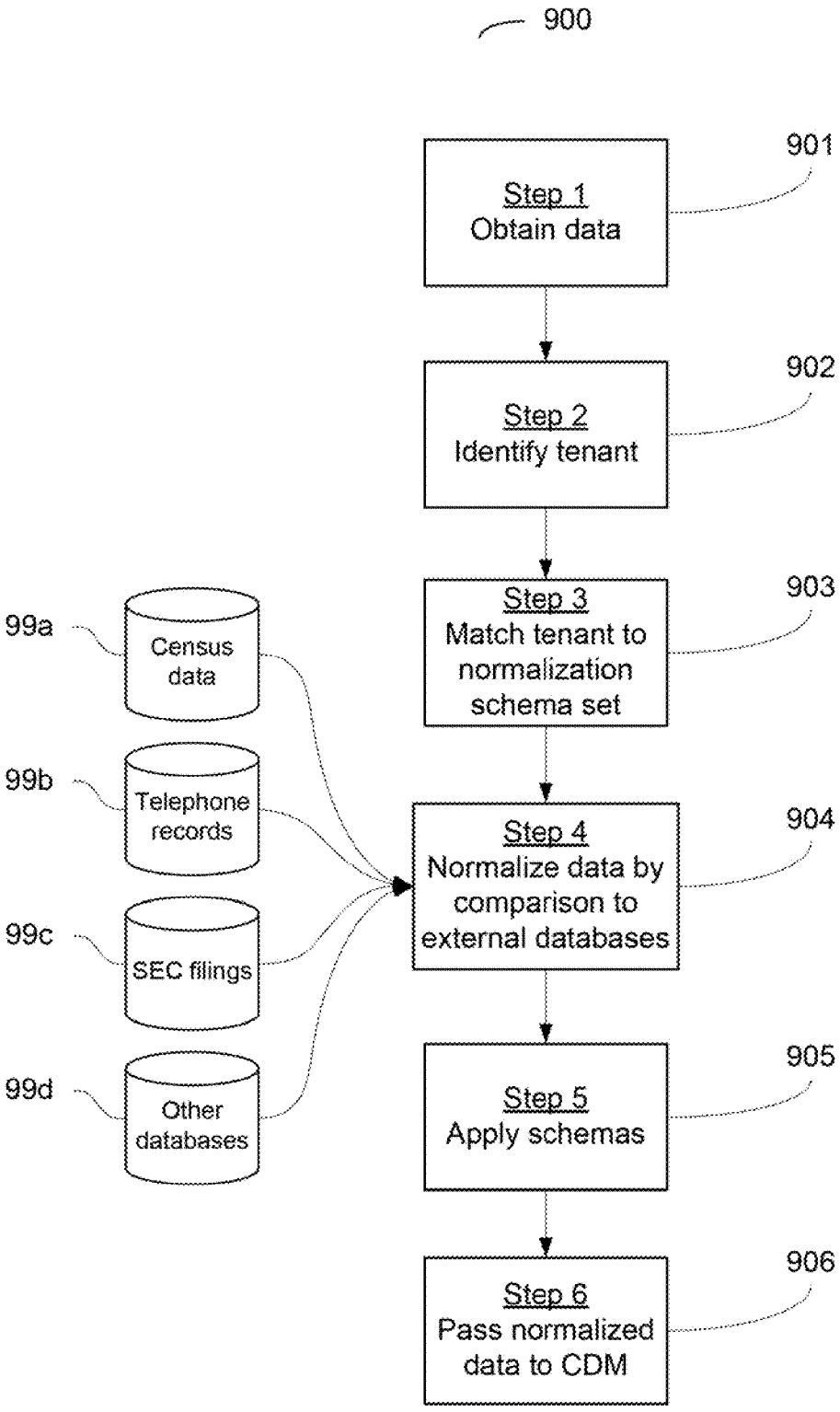

900
Step 1
Obtain data
901
Step 2
Identify tenant
902
Step 3
Match tenant to normalization schema set
903
Step 4
Normalize data by comparison to external databases
904
Step 5
Apply schemas
905
Step 6
Pass normalized data to CDM
906
99a
Census data
99b
Telephone records
99c
SEC filings
99d
Other databases

Figure 9

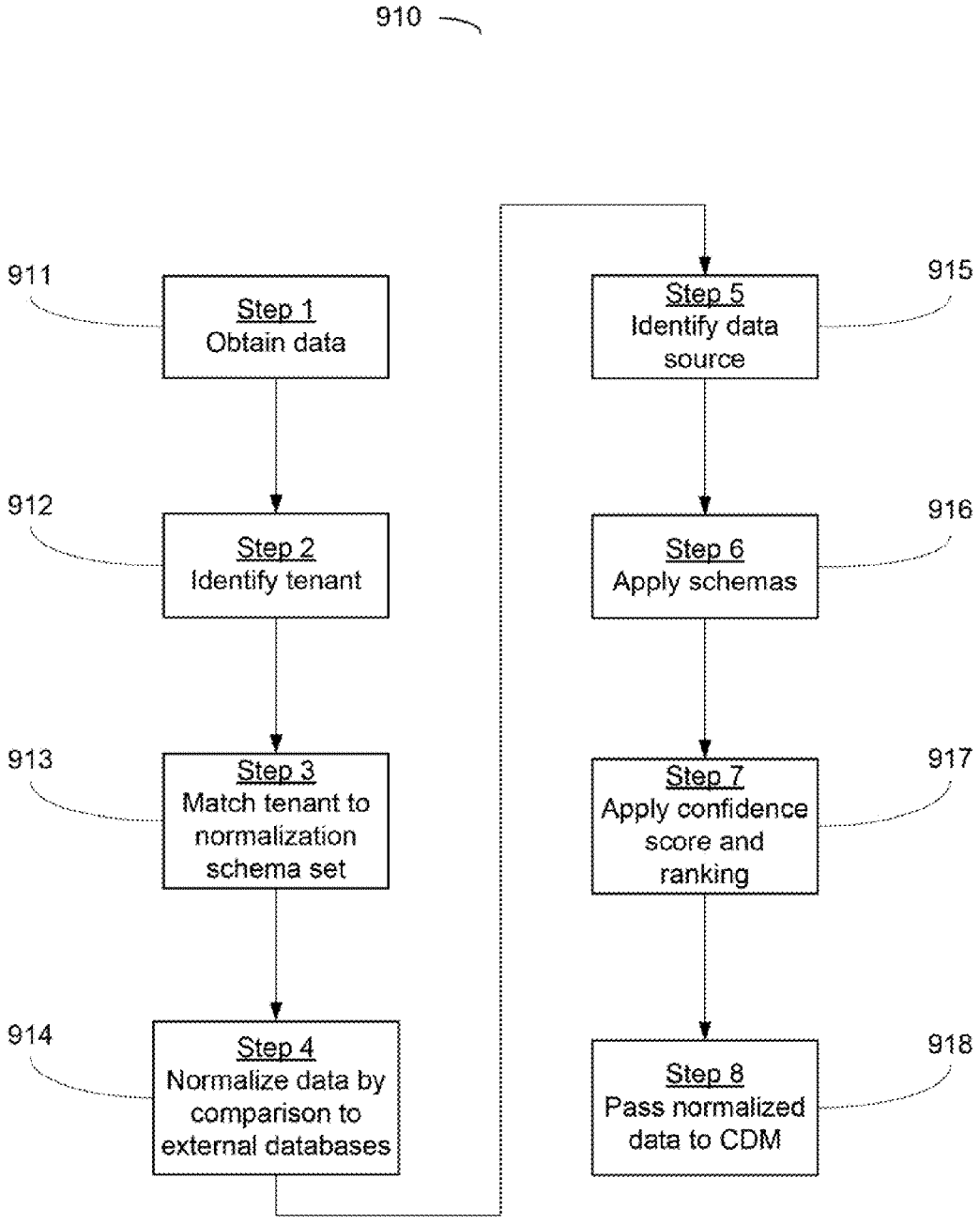

910
911
Step 1
Obtain data
912
Step 2
Identify tenant
913
Step 3
Match tenant to normalization schema set
914
Step 4
Normalize data by comparison to external databases
915
Step 5
Identify data source
916
Step 6
Apply schemas
917
Step 7
Apply confidence score and ranking
918
Step 8
Pass normalized data to CDM

Figure 10

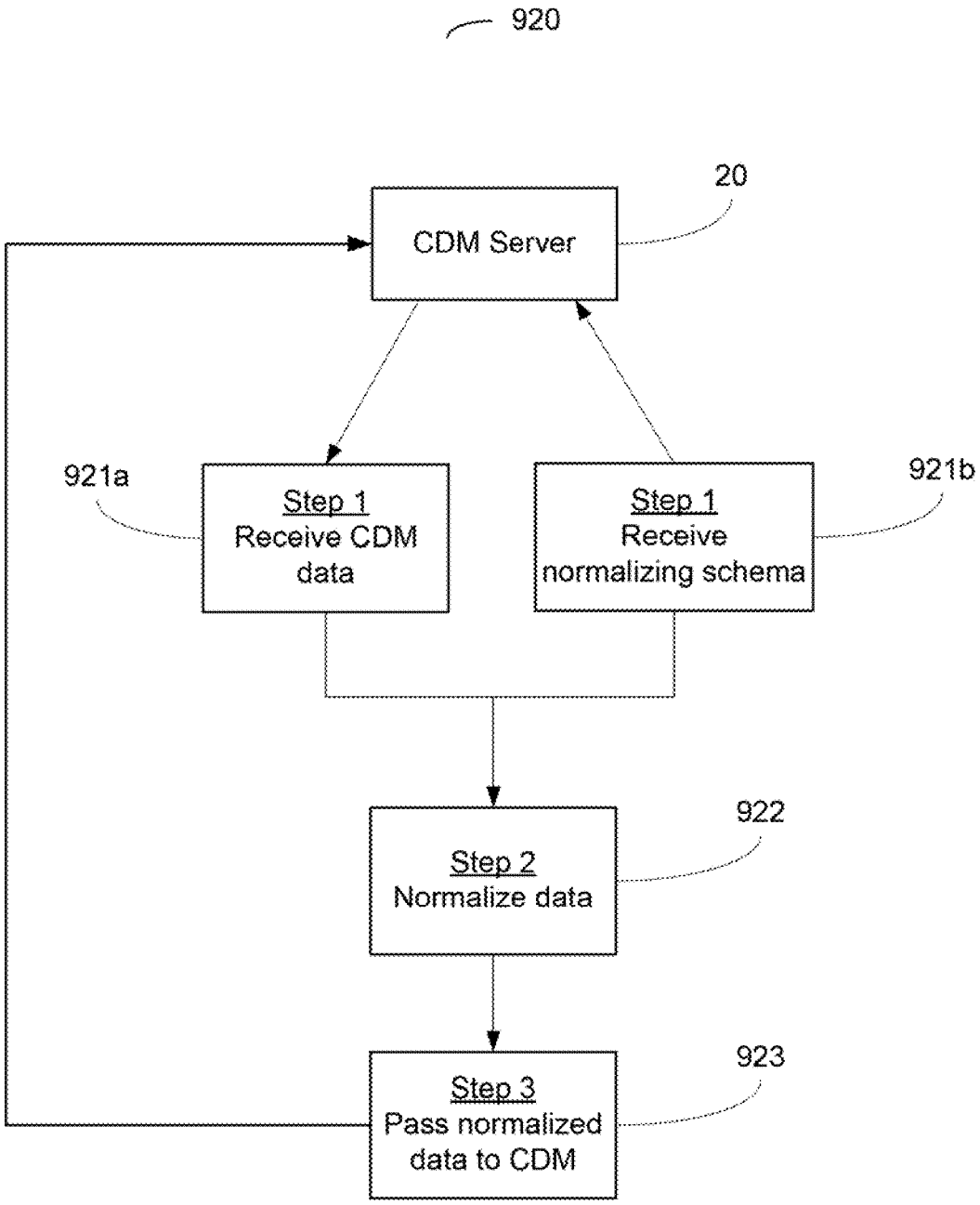

920
20
CDM Server
921a
Step 1
Receive CDM data
Step 1
Receive normalizing schema
921b
922
Step 2
Normalize data
923
Step 3
Pass normalized data to CDM

Figure 11

DATA NORMALIZER

FIELD OF INVENTION

The present invention pertains to the field of computer devices for management of data, and more specifically to a computer apparatus configured with software to prepare data from disparate data sources for contact data management systems.

BRIEF DESCRIPTION OF THE DRAWINGS

FIG. **1** illustrates an exemplary embodiment of a data normalizer with distributed network components capable of normalizing data from an infinite number of disparate data sources.

FIG. **2** illustrates an exemplary embodiment of a data normalizer with distributed network components which uses hand keyed data which is entered by users.

FIG. **3** illustrates an exemplary embodiment of a data normalizer with distributed network components which uses data compiled using a data gathering tool.

FIG. **4** illustrates an exemplary embodiment of a data normalizer which processes mass exported data.

FIG. **5** illustrates an exemplary embodiment of a data normalizer which resides on a local area network.

FIG. **6** illustrates an exemplary embodiment of a data normalizer with distributed network components capable of normalizing data in a multi-tenant environment.

FIGS. **7***a* and **7***b* illustrate exemplary graphical user interfaces for creating normalizer schema and schema updates to customize the functionality of a data normalizer.

FIG. **8** is an exemplary set of instructions with which a computer apparatus may be configured to perform data normalization for multiple contact data systems in a multi-tenant environment.

FIG. **9** is an exemplary set of instructions with which a computer apparatus may be configured for normalized data utilizing one or more external databases.

FIG. **10** is an exemplary set of instructions which assigns a confidence rating and score to normalized data based on the data source.

FIG. **11** illustrates an exemplary data handoff function.

GLOSSARY

As used herein, the term "administrator" refers to a user which has authority to alter normalization schema for a tenant.

As used herein, the term "Contact Data Management (CDM) System" refers to any hardware and software configured with rules and or/protocols for managing contact data. A Contact Data Management System includes, but is not limited to, Customer Relationship Management (CRM) systems, application tracking systems (ATS), enterprise resource planning systems, personal information management systems, docket and calendar systems, accounting systems, database software, behavioral tracking software, demographic analysis tools, resource sharing tools, content sharing systems, data mining systems and combinations of the foregoing, including all functionally equivalent hardware and software tools and systems.

As used herein, the term "Customer Data Management (CDM) handoff" refers to any manner known in the art in which a CDM may receive data for processing, or may call commands from a computer configured with instructions for normalizing data.

As used herein, the term "data compilation" refers to the accumulation of data by any method, tool or from any source known in the art.

As used herein, the term "data" refers to information obtained from any source which is capable of being stored on a computer readable media.

As used herein, the term "data gathering tool" refers to an apparatus configured with instructions capable of gathering data from one or more sources (including, but not limited to web sites, compilations, purchased lists, assembled lists, profiles, social networking resources, demographic research, applications, scanned forms, billing information, census data, public repositories of information, registration records, medical records, biological data information tracking databases, security records, transaction databases or any other data source containing information about person or entity). A data gathering tool may include internal processing tools which periodically check or accumulate data internally.

As used herein, the term "data handoff function" refers to the transfer of normalized data to a CDM.

As used herein, the term "disparate data source(s)" refers to data that is collected from more than one data source known in the art (including but not limited to web sites, compilations, purchased lists, assembled lists, profiles, social networking resources, demographic research, applications, scanned forms, billing information, census data, public repositories of information, registration records, medical records, biological data information tracking databases, security records, transaction databases or any other data source containing information about person or entity).

As used herein, the term "hand keyed data" refers to data physically entered by an administrator and/or a user.

As used herein, the term "mass exported data" refers to data deliberately exported in a large quantity from an identified data source.

As used herein, the term "module" refers to a portion of computer hardware or a memory storage component configured with instructions to perform a task.

As used herein, the term "multi-tenant environment" refers to an environment which includes one or more tenants.

As used herein, the term "normalization schema" refers to a set of normalization policies, protocols and/or criteria to be used for data normalization. Some examples of normalization schema may include normalization policies for addressing spelling, punctuation, abbreviations, reconstructed data, deconstructed data, spelling standards, abbreviations, symbols, character conventions, spacing, prefixes, suffixes, and ordinals.

As used herein, the term "normalized data" refers to data which has been processed according to normalization schema determined by an administrator.

As used herein, the term "normalizing data" refers to the process of conforming data records based upon an administrator-defined set of data normalization.

As used herein, the term "normalizing module" refers to a portion of hardware or storage media configured with instructions for normalizing data.

As used herein, the term "normalizing policy" refers to criteria for normalizing data. A normalization schema is comprised of one of more normalization policies. Selection of normalizing schema may be made by a user, administrator or tenant. Examples of normalizing policies include, but are not limited to, spelling, punctuation, abbreviations, reconstructed data, deconstructed data, spelling standards, abbreviations, symbols, character conventions, spacing, prefixes, suffixes, and ordinals. Normalizing policies may also be based on

results of comparisons of data to one or more databases and include policies for conforming data.

As used herein, the term "potential duplicate information" or "duplicate information" refers to any unit of data that is determined to be redundant or inaccurate based on any protocols determined by a tenant, user or administrator.

As used herein, the term "received data" means data received for inclusion in a CDM system derived from one or more data sources.

As used herein, the term "tenant" refers to any user or designated group of users of CDM data. A tenant may have one or more users that are designated as an administrator.

As used herein, the term "user" refers to any end user or administrator that receives or manipulates data in a CDM system.

As used herein, the term "user-selected" refers to any option selected by a user.

As used herein, the term "web-based" refers to any tool, component or service which is accessed from outside of the local area network of a user or tenant which operates on that network.

BACKGROUND

Businesses and individuals increasingly rely on management of contact data for communication, marketing, monitoring and other basic functions.

Management of data about persons or entities through Contact Data Management (CDM) Systems is a multi-billion dollar market, which experiences double digit growth each year, and which includes, but is not limited to, Contact Resource Management (CRM) systems. Management of contact data is critical to domestic and global productivity, and businesses of all sizes increasingly depend on the effective implementation of all business functions. It is also critical to governments and medical institutions and for security and tracking purposes.

A problem common to all CDM systems is the duplication of data entered into the system. It is estimated that most large scale CDM systems experience fluctuating duplication rates between 10 to 30 percent, and must devote considerable system resources to addressing complications caused by the duplication of data.

Because most CDM systems require periodic repetition of de-duplication processes, CDM systems experience fluctuating duplication rates between the times that the de-duplication process is performed rendering them more error prone.

Errors and redundant resources allocated to duplicated data cause a loss of business productivity, and compromise the overall functionality of CDM systems.

A typical scenario occurs when customer records are recorded in an inconsistent manner. For example, a contact may be shown as salesman Mary Smith in a company, "GRP Transport, Srvcs." A second listing may appear for Bob Jones with "Group Transportation Services." Several types of problems may arise from this hypothetical scenario.

One problem that may arise from this hypothetical may be that the contact entity receives multiple mailings or calls from the end user. Another problem is that the end user of the CDM system may not ever have consistent information about each customer. The customer information may be inconsistent because every time the customer record has to be updated, only one record is updated. There is no assurance that the most recently updated record will be subsequently revised, which results in inconsistent information being accessed. Another problem with duplicated records is that the end user is unable to accurately monitor user activity. Another type of problem may occur when multiple client personnel are contacted by the user's staff and duplicate services are rendered or inconsistent pricing and/or information is offered.

Data entered into a CDM may come from various sources (e.g., list broker services, hand entered data, web crawled data, social networks, association lists, magazine subscriber lists, e-mail signatures). Each of these disparate data sources may obey different rules on how they treat data, or may have no rules. As data is gathered using increasingly sophisticated technology and data mining tools, new types of data duplication errors and data record inconsistencies (e.g., spelling, abbreviation, punctuation, deconstruction, reconstruction anomalies and other differences in records referencing the same contact in disparate data sources) occur more frequently. De-duplication processes in existing CRM and CDM technologies cannot be effective unless data is conformed ("normalized") so that it can be adequately compared. Moreover, decisions on how to normalize data and the conventions to be used for normalizing data can differ greatly depending on the needs of a particular user (tenant) environment.

Most CRM and CDM de-duplication technologies rely on "library-style" retrieval, hash code and character comparisons to detect duplicates. These CRM and CDM components are not effective for screening massive amounts of data from disparate data sources during an updating process. The de-duplication components of CDM and CRM systems known in the art are also not designed to be dynamically updated to anticipate an infinite number of disparate data sources and tenants with unique requirements.

It is desirable to have a data normalization tool which can interface with various CDM systems and process data from infinite disparate data sources.

It is further desirable to have a tool which can normalize data specific to the needs of one or more tenants, and which can be adapted for multi-tenant environments.

It is further desirable to have a tool that can be dynamically updated to normalize data and to address an evolving range of potential data entry variations that can result from changes in data retrieval technology.

SUMMARY OF THE INVENTION

The present invention is a data normalizer which can be adapted for use for various CDM systems, including commercially available and CRM systems. The data normalizer prepares data for de-duplication by the CDM system and is configured to handoff data for processing to one or more CDM systems. In various embodiments, the data normalizer may be a web-based service or a software module compatible with existing CDM products, while in other embodiments the data normalizer may reside on the same local area network or devices as the CDM system. In various embodiments the data normalizer tool may be adapted for use in multi-tenant environments having disparate CDM needs and/or CDM systems. Normalization protocols may be dynamically updated. In various embodiments, the data normalizer allows an administrator to customize normalization schema, and to dynamically alter normalization schema.

DETAILED DESCRIPTION OF INVENTION

For the purpose of promoting an understanding of the present invention, references are made in the text to exemplary embodiments of a data normalizer, only some of which are described herein. It should be understood that no limitations on the scope of the invention are intended by describing these exemplary embodiments. One of ordinary skill in the art

will readily appreciate that alternate, but functionally equivalent data normalizers may be used. The inclusion of additional elements may be deemed readily apparent and obvious to one of ordinary skill in the art. Specific elements disclosed herein are not to be interpreted as limiting, but rather as a basis for the claims and as a representative basis for teaching one of ordinary skill in the art to employ the present invention.

It should be understood that the drawings are not necessarily to scale; instead, emphasis has been placed upon illustrating the principles of the invention. In addition, in the embodiments depicted herein, like reference numerals in the various drawings refer to identical or near identical structural elements.

Moreover, the instructions which are set forth are exemplary, and may be performed in any order or combined with other instructions to achieve substantially equivalent functionality.

FIG. **1** is an exemplary embodiment of a data normalizer system **100** operating over a geographically distributed wide area network. In the exemplary embodiment shown, data normalizer system **100** includes normalizing schema server **50** which is a computer readable media which tracks the normalizing policies **5***a*, **5***b*, and **5***c* and policy updates **24** comprising the schema for tenant **90**. In the embodiment shown, tenant **90** is a business entity which uses a CDM system which resides on the tenant's network. In other embodiments, the tenant may have a CDM system which resides on a server outside the tenant's network, and be accessed by the tenant over the internet.

In the embodiment shown, normalizing policies **5***a*, **5***b*, and **5***c* are determined by each tenant **90** by selecting normalization schema for use in that particular tenant's environment.

In the embodiment shown, tenant **90** is using a CDM system known in the art, but in other embodiments, tenant **90** may be using one or more disparate CDM systems or multiple CDM systems in conjunction with data normalizer system **100**, and each tenant **90** may be using normalizing policies **5***a*, **5***b*, and **5***c* determined by an administrator, which in the embodiment shown is CDM administrator **22**. An administrator may be a single user with administrative privileges.

As shown in FIG. **1**, normalizing schema server **50** is a computer readable media for storing normalized policies **5***a*, **5***b*, and **5***c*. In the exemplary embodiment shown, normalizing schema server **50** associates schema updates **24** with the normalizing policies **5***a*, **5***b*, and **5***c* as specified by CDM administrator **22** and/or users **10***a*, **10***b*, and **10***c*. Normalizing policies **5***a*, **5***b*, and **5***c* are updated using the graphical user interface **705** discussed in FIG. **7**. In the embodiment shown, normalized data server **60** is a computer apparatus configured with software and has processing components capable of using normalization schema to create normalizing policies which are applied data to be normalized.

In various embodiments, normalizing schema server **50** and normalized data server **60** processes data based on normalization schema selected and updated by any CDM administrator **22** or users **10***a*, **10***b*, and **10***c* with privileges to create or update normalizing policies.

In the exemplary embodiment shown, list **25** is data passed to CDM system by CDM administrator **22**.

Data normalizer system **100** further includes normalized data server **60** which applies normalizing policies **5***a*, **5***b*, and **5***c* to data which is passed to and from the CDM system.

In the embodiment shown, CRM administrator is an individual, entity or server with the ability to modify normalizing policies **5***a*, **5***b*, and **5***c*.

FIG. **2** illustrates an exemplary embodiment of a data normalizer in use to process data which is keyed in by users **10***a*, **10***b*, and **10***c* as hand entered data **82**.

Data is passed to CDM server **20** and CDM server **20** passes data over the internet to normalizing schema server **50** which tracks normalizing policy and schema updates and assigns an appropriate normalizing schema based on the tenant. Normalized data server **60** applies the appropriate normalizing polices to data which is returned to the CDM server **20** as normalized data **70**.

FIG. **3** illustrates data compiled by a data gathering tool **77** directly. Data is passed to CDM server **20**, which passes data to be normalized over the internet **30** to normalizing schema sever **50** and normalized data server **60**, and normalized data **70** is returned for use by CDM server **20**.

FIG. **4** illustrates mass exported data **86** directly loaded by a CDM administrator **22** into a CDM server **20**, which is then passed to a normalizing schema server **50**.

Mass exported data **86** is then passed to a normalized data server **60**, which passes the mass exported data **86** over the internet **30** to the CDM server **20** as normalized data **70**.

FIG. **5** illustrates an exemplary embodiment of a data normalizer system **100** which resides on a local area network (LAN) **35** with a CDM network sever **36** and which may be purchased by a client or a software vendor to be used with a particular CDM system.

The CDM network server **36** illustrated in FIG. **5** includes normalizing schema component **50**, normalized data component **60**, and CDM component **20**, all of which reside on a single server or LAN **35** and which are accessed by users **10***a*, **10***b*, and **10***c*.

FIG. **6** illustrates an exemplary embodiment of a data normalizer system **100** with distributed network components capable of normalizing data in a multi-tenant environment. In the embodiment shown, data normalizer system **100** serves tenants **90** and **95**. In other embodiments, data normalizer system **100** may serve more or fewer tenants, and tenants may be distributed over a WAN or LAN.

As FIG. **6** illustrates, each tenant **90** and **95** has its own normalized data **70***a* and **70***b*, lists **25***a* and **25***b*, and schema updates **24***a* and **24***b*. Normalizing schema server **50** and normalized data server **60** serve tenants **90** and **95**.

FIG. **7***a* illustrates an exemplary graphical user interface **705** which displays multiple normalization schemas **730** and **770**. Normalization schema **730** and **770** are rules which are applied by normalizing policies. Exemplary normalization schema **730** and **770** include do nothing, convert "and" to "&," convert "&" to "and," and to abbreviate various prefixes and suffixes such as "incorporation" and "company."

The embodiment shown illustrates a graphical user interface **705** in which a user can select from numerous normalization schema **730** and **770**. An infinite number of normalization schemas can be added to a graphical user interface (GUI) **705**, and normalization may be accomplished by treating recognized data, reconstructed data and deconstructed data to any rule imposed or devised by a CDM administrator and/or user. In still other embodiments, data may be normalized using the interim step of comparative database analysis, as later illustrated in FIG. **9**.

Also shown in FIG. **7***a* are the following GUI options: parameters **720** which are specific words, ordinals and/or symbols in data that a user may want normalized, actions **730** which include the normalization schema a user may choose to normalize the parameter **720** selected, before **740** which displays a preview of what the data looked like before normalization, preview **750** which displays what the data will look like following normalization, and help screens **760** for

explaining the function of each normalization schema/action **730** and **770**. Function buttons **788***a*, **788***b*, and **788***c* allow a user to edit, save or manage changes made on the graphical user interface **720**.

FIG. **7***b* illustrates a graphical user interface as in FIG. **7***a*, but also includes a function button for comparison to external databases **790**.

FIG. **8** illustrates an exemplary set of instructions **800** with which a computer apparatus may be configured to perform data normalization for multiple contact data systems in a multi-tenant environment. In Step **1 801**, the computer apparatus obtains data. The tenant is identified in Step **2 802**, and the tenant is matched to its normalization schema set **803**. The normalization schemas get applied **804** and the normalized data is passed to the CDM **805**.

FIG. **9** illustrates an exemplary set of instructions **900** with which a computer apparatus may be configured for normalized data utilizing one or more external databases. For example, data may be compared for accuracy to public records and other databases. In Step **1 901**, the computer apparatus obtains data. The tenant is identified in Step **2 902**, and the tenant is matched to its normalization schema set **903**. In Step **4 904**, the computer apparatus then normalizes the data by comparison to external databases **99***a*, **99***b*, **99***c*, and **99***d*. The normalization schemas are then applied **905**, and the normalized data is passed to the CDM **906**.

FIG. **10** is an exemplary set of instructions which assigns a confidence rating and score to normalized data based on the data source. In Step **1 911**, the data is obtained. The tenant is identified in Step **2 912**, and the tenant is matched to its normalization schema set **913**. The data is normalized by comparison to external databases **914**, and the data source is identified **915**. The normalization schemas are then applied to the data **916**, and a confidence score and ranking are applied **917**. The normalized data containing the confidence score and rating is finally passed to the CDM **918**.

FIG. **11** illustrates an exemplary CDM handoff **920**. Data from the CDM server **20** is received **921***a* in conjunction with a normalizing schema **921***b*. The normalizing schema is used to normalize the data **922** and in Step **3 923**, the normalized data is passed back to the CDM server **20**, which will continue to apply the normalizing schema.

What is claimed is:

1. A computer apparatus comprised of:

a normalization processing component configured to receive mass exported data from disparate data sources for a plurality of tenants,

wherein each of said plurality of tenants uses heterogeneous Contact Data Management (CDM) systems,

wherein said normalization processing component is further configured to return normalized data to each of said heterogeneous systems,

wherein said mass exported data is normalized by said normalization processing component based on a data normalization policy associated with each tenant,

wherein said mass exported data is normalized using at least one normalization schema comprised of standard semantic and linguistic character combinations utilized in all CDM systems,

wherein said normalization processing component further includes a set of computer readable instructions to retrieve said normalization schema and compare said normalization schema to data in an external database and to assign a reliability score to said data based on said external database.

2. The apparatus of claim **1** which further includes at least one computer readable media for storing said at least one data normalization schema.

3. The apparatus of claim **1** which further includes a component for updating said at least one data normalization policy which is used to create at least one updated data normalization schema in real time.

4. The apparatus of claim **3** wherein said normalization processing component includes an open source software component configured to enable a user to update said at least one updated data normalization policy by updating an open source database of normalization schema.

5. The apparatus of claim **1** wherein said at least one data normalization schema calls functions which transform data to be consistent with normalization schema.

6. The apparatus of claim **1** wherein said normalization processing component is web-based and associates said at least one data normalization schema with at least one tenant in a multi-user environment.

7. The apparatus of claim **3** which associates said at least one updated data normalization schema with at least one tenant.

8. The apparatus of claim **1** which is configured to perform a data handoff function to at least one CDM system.

9. The apparatus of claim **1** which is further configured to perform a data handoff function to a plurality of CDM systems.

10. The apparatus of claim **1** wherein said at least one normalization processing component is web-based.

11. The apparatus of claim **1** wherein said at least one normalization processing component resides on a local area network with at least one CDM.

12. The apparatus of claim **7** which is further configured with software to allow said computer apparatus to perform a data handoff function to at least one user-selected CDM system.

13. The apparatus of claim **1** wherein said at least one data source is selected from a group consisting of keyed data, mass exported data, and data obtained by a data gathering tool.

14. A data preprocessing apparatus comprised of:

at least one computer having at least one CDM system;

at least one collection module configured to interface with said at least one CDM system and obtaining data collected by said at least one CDM system; and

a normalization processing component configured to receive mass exported data from disparate data sources for a plurality of tenants,

wherein each of said plurality of tenants uses heterogeneous CDM systems,

wherein said normalization processing component is further configured to return normalized data to each of said heterogeneous systems,

wherein said mass exported data is normalized by said normalization processing component based on a data normalization policy associated with each tenant,

wherein said mass exported data is normalized using at least one normalization schema comprised of standard semantic and linguistic character combinations utilized in all CDM systems,

wherein said normalization processing component further includes a set of computer readable instructions to retrieve said normalization schema and compare said normalization schema to data in an external database and to assign a reliability score to said data based on said external database.

15. The apparatus of claim **14** which includes at least one normalization policy tracking component which is configured to update said at least one normalization schema with at least one tenant.

16. The apparatus of claim **14** which is further configured to update said at least one normalization schema to create an updated normalization schema and associating said updated normalization schema with at least one normalization policy to create an updated normalization schema.

17. The apparatus of claim **14** wherein said at least one normalization schema is updated by at least one administrator in real time using a graphical user interface.

18. The apparatus of claim **14** wherein said at least one normalization schema includes computer readable instructions to compare data derived from a first database to data contained in a second database.

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